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XVI. Miscellaneous

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Age-Related Changes in Sensorimotor Performance

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—The purpose of this study is to identify sensorimotor parameters of aging in normal subjects and in patients with injuries to the central nervous system. It will compare responses of normal adults and CNS-injured patients with respect to evoked potentials, vibratory sensation, walking and standing patterns, muscle responses in gait, quiet standing, and activities of daily living. Muscle responses following tendon taps, muscle stretch, electrical stimulation, and simple voluntary limb move-

ments will also be monitored.

Normal adults (ages 18-90 years) and patients with stroke, spinal cord injury, traumatic head injury, amyotrophic lateral sclerosis, Parkinson's disease, Alzheimer's disease (dementia), multiple sclerosis, cervical spondylotic myelopathy, cerebral palsy, and patients who are classified as frequent fallers will be tested. The normal data will be evaluated for changes with aging and will be used as a baseline for the evaluation of the pathologic conditions.

Chest Wall Stiffness in Patients with Chronic Respiratory Muscle Weakness

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Sponsor: None Listed

Purpose—Using the weighted spirometer technique, we studied chest wall compliance (C_w) in 16 nonobese patients with chronic weakness of the respiratory muscles and 20 healthy control subjects. In order to evaluate the validity of the technique, while C_w was being measured, we monitored thoracoabdominal configuration with two pairs of linearized magnetometers and electrical activity of the external oblique with a concentric needle electrode in three healthy subjects and four patients; in addition, we recorded in three subjects the electrical activity from the intercostal muscles and diaphragm throughout the procedure.

The method was reproducible within 5.8 percent and provided C_w values that compared well with those yielded by the relaxation technique. In each subject, the weight-induced shifts in end-expiratory lung volume showed a very good linear correlation with the changes

in transrespiratory pressure and end-expiration ($r=0.91$). In addition, in none of the subjects tested did the electromyograms reveal any intercostal, diaphragmatic, or abdominal muscle activity at end-expiration, nor did the end-expiratory level ever show a significant departure from the relaxed thoracoabdominal configuration, thus suggesting adequate respiratory muscle relaxation. The reduction in inspiratory muscle force in the patients ranged from 17 to 94 percent of predicted (mean \pm SE, 43 ± 6).

The decrease in vital capacity, total lung capacity, and functional residual capacity averaged 59, 34, and 15 percent of predicted, respectively. Both the patient and the control groups showed a large interindividual variability regarding C_w . It varied from 0.117 to 0.258 L/cm H_2O (mean \pm SE, 0.162 ± 0.012) in the patients and from 0.163 to 0.366 L/cm H_2O (mean \pm SE, 0.248 ± 0.013) in the healthy subjects. The C_w

value was below the control range in 12 of the 16 patients and the difference between the patient and control groups was significant ($p=0.001$). We conclude that: 1) the weighted spirometer technique allows accurate measure-

ments of chest wall compliance to be obtained; and 2) chest wall stiffness develops in patients with longstanding weakness of the respiratory muscles.

Noninvasive Quantitation of Venous Reflux

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Sponsor: *VA Rehabilitation Research and Development Service*

Purpose—Chronic venous insufficiency can impair patient mobility but is difficult to assess due to the lack of objective, noninvasive, and routinely usable clinical tests. To improve assessment, we have developed a test for quantitative measurement of venous reflux and for separate identification of deep and superficial involvement. The test is noninvasive and requires minimal patient cooperation. The total venous reflux measurement system uses an inflatable boot placed over the lower limbs from foot to below the knee, in the seated subject. The boot is inflated to 60 mm Hg, and calf volume is measured by impedance plethysmography when the boot pressure is abruptly released, allowing blood to return to the limb. Changes in impedance with time measure the

rate of change in volume and therefore blood flow. To obtain a separate measurement of deep venous reflux, a tourniquet is placed above the knee to impede flow through the superficial system, and the test is repeated. To calculate superficial reflux, one subtracts deep reflux from total reflux.

Results—Evaluation of the method was carried out in a series of 89 limbs. A grouping of 35 limbs according to venography findings showed that the test of total reflux provided a differentiation of patients according to the presence of primary and/or secondary varicosities. The superficial reflux measurements provided a further differentiation of patients with primary varicosities.

The Definition of "Peer": Consumer Perspectives and Significance in the Delivery of Counseling Services

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Sponsor: *National Institute of Handicapped Research*

Purpose—This project is intended to provide initial data on the perceptions of disabled persons with respect to the definition of peer and the provision of counseling services by peers. Consumers' opinions will be solicited on characteristics of peer counselors which enhance credibility and lead to highest levels of satisfaction with peer counseling services delivered by independent living centers.

Progress—In this initial investigative effort, the research has been delimited to three dis-

ability groups—mobility impaired persons, visually impaired persons, and hearing impaired persons. After the methodology has been developed and validated, additional research might focus on other disability groups. The methodology will involve the development and pilot testing of the content and format for an interview survey; training of interviewers who will collect the data; collection of data from disabled individuals using the interview approach in various geographical locales to obtain a sample that is diverse with respect to age, ethnic mix, type of

disability, and socioeconomic status; analysis of data collected from disabled consumers; and articulation and dissemination of research findings.

An extensive literature review has been conducted. Using information from this search and input from senior project consultants, the interview content and format for the consumer survey are being developed.

A new dimension has been added to this

study in response to the completion of the national evaluation of independent living centers conducted by Berkeley Planning Associates. This evaluation gathered much information of relevance to the Center's study. The consultant services of Berkeley Planning Associates are being obtained. This valuable resource is currently being explored for conclusions and insights regarding the relationship of concepts of "peer" to independent living outcomes.

Predicting the Success of Lumbar Sympathectomy in Patients with Severely Ischemic Foot

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—The role of lumbar sympathectomy in the management of patients with arteriosclerotic occlusive disease of the lower limbs remains a subject of considerable discussion. Much of the confusion concerning lumbar sympathectomy is due to a lack of procedures that accurately and sensitively select those patients to whom lumbar sympathectomy may be of benefit. We have carried out a retrospective review of 101 lumbar sympathectomies to examine the role of a distal thigh (above-knee)/arm systolic pressure index in selecting patients for lumbar sympathectomy. Previously, we have established criteria using doppler systolic ankle pressure, ankle to brachial systolic pressure ratio, external magnetic flowmetry measurements of peak pulsatile calf blood flow, and thermistor thermometry in selecting patients for lumbar sympathectomy.

Progress—Our experience has shown that lumbar sympathectomy as an initial operative procedure is of benefit to patients with severe ischemia of the foot and gangrene secondary to atherosclerotic occlusive disease. We have further reviewed our experience with lumbar sympathectomy in patients with toe gangrene not amenable to direct arterial surgery.

Results—Of the 101 lumbar sympathectomies, 11 were excluded due to concomitant direct ar-

terial surgery or from being lost to followup. Data presented are thus based on 90 lumbar sympathectomies done on 82 male patients. The beneficial effects of lumbar sympathectomy were the relief of symptoms, the prevention of major amputation, or an improvement in disabling intermittent claudication. In these patients, it was found that a doppler systolic above-knee/brachial pressure index of 0.60 or better and an external magnetic flowmetry mean calf bloodflow of 30 ml/min or greater were found to be good predictors of a beneficial effect from lumbar sympathectomy. These data are currently being prepared for publication.

The benefit of lumbar sympathectomy in the management of gangrene in patients not amenable to direct arterial surgery was examined in 45 patients (50 limbs) with gangrene limited to the toes, 31 patients (32 limbs) with gangrene of the foot, and 8 patients (11 limbs) with gangrenous involvement of the leg. At 8 years, the cumulative toe salvage rate of patients with toe gangrene was 51 percent and cumulative limb salvage rate was 71 percent. The cumulative survival rate in three patients at 1 to 2 years was 71 percent and at 5 to 6 years was 40 percent. The presence of diabetes did not significantly influence limb or toe salvage. In most patients with digital gangrene not amenable to direct arterial surgery, lumbar sympathectomy works to salvage limbs and toes.

A Short Awareness Course on Microcomputers in Rehabilitation and Special Education

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Sponsor: *None Listed*

Purpose—The introduction of microcomputers into rehabilitation has had a significant impact on the range of devices and software available for disabled people. It is often difficult for health professionals and special educators to gain the firsthand experience necessary to appreciate the potential of this new technology.

Progress—To overcome this problem, we have been conducting a 1-week awareness course titled "Microcomputers in Rehabilitation and

Special Education" for people who want to apply microcomputers in rehabilitation or education of children and adults with physical disabilities. The course includes lectures, demonstrations, and hands-on experience using 17 Apple IIe computers. A comprehensive set of notes and tutorials has been generated and participants are supplied with a copy of public domain software, manuals, and a switch. This course is funded from registration fees.

Cardiac Rehabilitation: Preliminary Results and Treatment Efficacy

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Purpose—We use a multidisciplinary team approach to provide a comprehensive pragmatic 10-week cardiac rehabilitation program for veterans. This program emphasizes physical activity to promote physical and cardiovascular fitness. Education and counseling seek to identify and correct or modify risk factors, increase knowledge of the pertinent aspects of the patient's heart disease, and to evaluate and improve psychosocial factors influencing the development of, and recovery from, heart disease. Group sessions are held three times per week for both exercise and risk factor modification. Individual intervention around any targeted risk factor or concern is provided as needed.

Progress—Two studies were designed in an effort to evaluate the effectiveness of this comprehensive approach to cardiac rehabilitation. In Study 1, the charts of 44 randomly selected male cardiac rehabilitation patients were reviewed retrospectively to evaluate the success of the cardiovascular fitness aspect of the program. The mean age of the patients was 59,

with an age range from 48 to 79 years. Twenty-one of the patients had undergone coronary artery bypass grafts (CABG). Risk factors assessed included hypertension, family history of heart disease, smoking, diabetes, and hyperlipidemia. Of the 44 patients, 13 had one risk factor in their history or life style, 13 had two factors, 11 had three factors, and four patients had four risk factors. Using the New York State Heart Association Functional Classification (NYSHAFC) system, two patients were rated Class II, 35 patients were rated Class III, and seven patients were rated Class IV. Post-treatment significant cardiovascular improvements were demonstrated by changes in functional classification, energy expenditure, and increased oxygen consumption. Age, number of prior risk factors, and previous CABG surgery were not significantly correlated with cardiovascular improvement.

Study 2 was conducted to examine the effectiveness of group and individual modification of selected targeted behaviors. Subjects were 18 male veterans who completed the 10-week car-

diac rehabilitation program. The mean age was 58.1 years. Fifteen of the subjects were married; two were separated, and one was widowed. Fourteen of the subjects were retired; two returned to work, and two were unsure of their status. Average self-reported onset of CAD was 5.35 years. The mean number of risk factors, using the American Heart Association guidelines, was 5.5. Each subject completed pre-treatment and post-treatment assessment batteries which included the Jenkins Activity Survey (JAS), Beck Depression Inventory (BDI), Multidimensional Health Locus of Control (MHLOC), the Hopkins Symptom Checklist (HSCL), and the Albany Cardiac Rehabilitation Program Questionnaire (ACRPQ). The ACRPQ was developed by the program to gather background data, and to assess risk factors and self-reported ratings of knowledge of heart disease, and satisfaction with physical functioning and emotional well-being.

Post-treatment subjects reported a significantly greater satisfaction with physical and emotional functioning. The HSCL also demonstrated significant improvements on the mean

total scores, and on subscales which measured interpersonal sensitivity, somatization, and agitated depression. There were no significant changes found across treatment for the BDI, STAI, or MHLOC scores. The ACRPQ failed to show significant changes on measures of ability to handle stress, number of physical exercise, sleep, blood pressure, weight, pain or smoking cessation, although trends for improvement were noted in several of these categories. Post-JAS scores were not analyzed because the large number of subjects who were unemployed invalidated the test scores.

Future Plans—Based on the encouraging results on the above studies, which demonstrate the effectiveness of such a program for the older, generally retired, veteran population, a 3-year grant proposal has been submitted to HSR&D. This proposed study would allow for a controlled comparison of this multifaceted treatment program with a more traditional medical treatment approach. In addition, it would use a more comprehensive data and a larger population.

Reliability and Validity of CT and NMR

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Purpose—The objectives of this research are to assess the inter-observer reliability, intra-observer reliability, and the validity of computerized tomography (CT). Variables such as type of machine, setting, years of observer experience, and anatomic site will be explored for effects on reliability and validity.

Progress—The design incorporates six body readers from three different settings and three neuro readers from three different settings. The sample scans were randomly selected from each of three sites with equal numbers in three anatomic areas and read independently by each reader in a blind fashion. Each of the three neuro readers have currently read all 90 scans in the original data set. Manual scoring of the

interpretations is well under way.

Scoring has been divided along several dimensions. First, each reader was asked to provide a general abnormality score from the following list: 1) definitely abnormal; 2) probably abnormal; 3) questionably abnormal; 4) definitely normal; 5) technically unsatisfactory. Three criteria are being used to judge agreement along this dimension. Second, the interpretations are being scored for agreement on specific location of the abnormality (i.e., the "slice" of the scan which exhibits the abnormality best). Third, the interpretations are being scored for agreement on etiology, diagnosis, and other findings. All interpretation pairs which yield disagreements are reviewed and scored by an independent physician.

Two of the three neuro readers have completed reading one half of the original data set for inter-observer reliability. Scoring of this data set is as described above. Five of the six body readers have completed reading the original 180 body scans in the original data set. The sixth reader has less than 30 scans to finish the set. No body reader has begun the rereading process to assess intra-observer reliability.

All inpatient records have been reviewed at

each of the three participating institutions in order to assess validity of the study interpretations. Information such as discharge diagnosis, evidence for diagnosis, and original clinical interpretation of the scan has been extracted from the clinical records. Outpatient records are still being sought. Validity will be assessed using receiver operating characteristic (ROC) curves which will allow significance testing for area under the curve.

Skin Blood Flow by Helium Flux Effect of Skin Temperature

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Baumgardner (1985) described a new technique for measurement of skin blood flow using helium flux in people. He found, in a limited number of normal subjects, a large change in blood flow with increasing skin temperature over the range of 34 degrees C to 44 degrees C. We confirmed the temperature-dependant effects of skin blood flow in 36 normal human volunteers, and compared our data to those of Baumgardner's original study.

Progress—Normal human subjects breathed a mixture of 80 percent helium and 20 percent oxygen via a tight-fitting face mask and anesthesia breathing circuit. After equilibration with the breathing mixture (15 to 30 minutes), helium flux through the skin was measured by passing 100 percent nitrogen over the skin

through a temperature-controlled skin probe (2.5 cm diameter). The nitrogen sweep stream was analyzed for helium by a helium leak detector (Leybold-Heraeus Model M2) located downstream from the probe. Steady-state flux rates of helium were determined at each temperature of the probe, which was gradually increased from 33 degrees C to 42 degrees C in steps.

Results—The results are comparable with the original data of Baumgardner, corrected by a factor of 2 for the skin probe area actually swept by nitrogen. We conclude that skin blood flow measured by helium flux increases with skin temperature in a linear fashion between 33 degrees C and 42 degrees C.

Comparison of Helium Flux and Laser Doppler Skin Blood Flow Measurements: Effect of Skin Temperature

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Purpose—Laser doppler velocimetry is a totally noninvasive rapid technique for evaluation of skin blood flow. Unfortunately, it is not quanti-

tative, and it is difficult to compare readings among different patients or even at different locations on the same patient. We have studied

the change in laser doppler (Periflux PF2) skin blood flow measurement of patients resulting from a step change in temperature, and found that the increase in laser doppler signal correlated well with skin perfusion as assessed by fluorometry. The purpose of this study was to compare laser doppler velocimetry in normal volunteers and helium flux blood flow determinations (Baumgardner, 1985) over a range of temperatures.

Progress—We constructed an accurately controlled metal temperature probe for the laser doppler and applied it to the skin of the volar aspect of the forearm in normal volunteers. Adjacent to the laser probe, we attached the helium flux probe (also temperature controlled) for measurement of transcutaneous helium

flux. All subjects breathed a mixture of 80 percent helium and 20 percent oxygen for 15 to 30 minutes to achieve a constant blood tension of helium. We recorded the helium flux and laser doppler signals continuously while the probe temperatures were increased from 36 degrees C to 42 degrees C in three degree C increments.

Results—We found that both signals increased with temperature and that the laser doppler data agreed with previously published work (Enkema, et al., 1981). We conclude that laser doppler velocimetry increased nonlinearly with blood flow in agreement with others. Change in the optical properties of the skin to laser light or increase in static blood volume with temperature are possible causes of this effect.

Comparison of Helium Flux and Xenon Washout of Skin Blood Flow Measurements in Man

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Purpose—The reference standard for all skin blood flow measurements is generally regarded to be the Xenon washout technique described by Sejrsen (1969). Baumgardner et al. (1985) described a helium flux technique for quantitative skin blood flow measurements. This technique measures the quantity of helium transported through the skin to a small heated probe, while the subject inspires a known helium-oxygen mixture. A mass balance equation is used to compute blood flow under the probe using a model equation which requires an estimate of the diffusional resistance of the stratum corneum to helium.

Results—In six subjects, we compared the

helium flux skin blood flow determinations at 33 degrees C to those of the classic epicutaneous Xenon washout technique. Diffusional resistance of the stratum corneum was assumed equal to zero in each subject by measuring helium flux after vigorous skin stripping with adhesive tape. When the results of the two methods were plotted as blood flow per unit area of skin (Q/A) in ml/min/cm², the blood flow measured by helium flux was approximately double the value determined by Xenon washout technique. The discrepancy between the two methods may be related to the underlying assumptions of the model equations used to calculate the blood flow or to errors in estimation of diffusional resistance.

Evaluation of Cutaneous Blood Flow in Dysvascular Patients and Normals: Laser Doppler and Fluorometry

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Laser doppler velocimetry is a totally noninvasive rapid technique for evaluating skin blood flow. Unfortunately it is not quantitative, and individual readings are difficult to interpret or compare over different regions of the body or from day to day. We found that the laser doppler response to a skin temperature increase provided a consistent but nonlinear change in signal for an increase in blood flow measured independently. This nonlinear response has been shown by others. These temperature-induced flow changes proved much more useful than the absolute level of indicated blood flow in assessing patients.

Progress—We studied 5 normal healthy volunteers and 20 patients with peripheral vascular disease. The increase in laser doppler signal in

response to a step increase in skin temperature (T) over the range of 32 degrees C to 44 degrees C in two 6-degree increments was fit empirically to an exponential function: $f(T) = A^{bT}$. The rate constant b was found to yield the most consistent results with respect to skin blood flow and clinical outcome.

The 20 patients coming to amputation were retrospectively divided into two groups. Group I included all patients with amputations at the transmetatarsal level or below that healed (N=7). Group II included all patients requiring amputations above the transmetatarsal level (N=13). We concluded that the response to a temperature challenge yields consistent results comparable to fluorometry for evaluation of skin blood flow.

Return to Work After Cardiac Rehabilitation

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Sponsor: None Listed

Purpose—Over a 3-year period, data were obtained in 281 patients on the time they returned to work (TRW), their professional reclassification (PR), and the type of cardiovascular disease (CVD) they have. These data were correlated with profession (P) and age (A). Cardiac rehabilitation was based on an accelerated program, i.e., with phase two (outpatient phase) immediately following the hospitalization phase (1 to 2 weeks) for a total duration of 3 months (3x1 hr/week), with alternating ECG-controlled dynamic exercises.

Results—The obtained results showed the following. 1) Sixty-two percent of the 281 patients were economically still fully active prior to the

CVD; of this active subgroup 75 percent returned to work after completing the rehabilitation program. 2) TRW versus P — self-employers and professionals return earlier to work than blue collar workers. 3) TRW versus A — the older the patient, the longer the time until returning to work. 4) TRW versus CVD — after coronary bypass, patients return to work sooner than after infarction. 5) PR versus P — a high percentage of self-employed and white collar workers resume work sooner when the working conditions are restructured. 6) PR versus A — elderly persons with problems of professional reintegration often retire prematurely. 7) PR versus CVD — postinfarction as well as postbypass patients resume work with or without

restructuring of working conditions. Accordingly, factors with a negative influence on work resumption are higher age, blue collar status, and

the impossibility of appropriately restructuring working conditions.

New Technique for Dynamic Exercise Echocardiography

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Sponsor: *None listed*

Purpose—The use of two-dimensional echocardiography to quantify ventricular function in cardiac patients during peak dynamic exercise is hampered by various technical difficulties, mainly related to movements of the thorax and interposition of lung tissue. We developed an exercise system designed to combine: 1) relaxation of all thoracoabdominal muscle strain even at maximal workload; 2) supported abduction of the left arm to optimize rapid and accurate selection of echowindows; 3) left lateral (adjustable range from 90 degrees to 170 degrees) position. In order to relax thoracoabdominal muscle strain, dynamic exercise was per-

formed by alternating oscillatory movements of both legs with fixation of both knees and hips, thereby mobilizing all major muscles of the lower limbs. Resistance to the oscillating movement could be calibrated electronically in both directions up to 150 watts (steps of 15 watts). The cardiovascular response ($N=20$ healthy subjects) at peak exercise was compared at a similar workload on a standard bicycle and treadmill ergometer. It was shown that this innovative technique allows high resolution 2DE measurements in cardiac patients during peak exercise in the absence of any major thoracoabdominal interference.

Data Collecting, Analysis, and Reporting Via Computer in Cardiac Rehabilitation Programs

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Sponsor: *None Listed*

Purpose—Cardiac rehabilitation (CR) has gained its place in the treatment of a variety of cardiac diseases, either as an adjuvant to medical and surgical treatment, or as a first choice treatment in some diseases as well as in primary and secondary prevention. A multidisciplinary team provides comprehensive care for the multiple problems of the cardiac patient. Objective evaluation of such a multidisciplinary treatment is difficult in view of the multiple angles of attack through which a CR program interacts with cardiac disease and its risk factors. In order to correctly evaluate such a CR program, multivariate analysis is needed.

Progress—A specific computer program was designed to fulfill this goal. A suitable input format was chosen to facilitate the work of the team members and to reduce computer time. The program structure can be summarized as follows: patient entry (administrative, medical, social, and psychological data); session entry (medical and exercise data); output (reports on medical status and evolution, psychosocial evolution, exercise parameters and problems, prognosis, and tariffication); storage (short- and long-term statistical analysis). Experience with statistical analysis thus far has been based on a total of 400 patients.

Rehabilitation Aid

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Sponsor: *None Listed*

Purpose—"Magpie" is a foot-operated manipulator for use by anyone who has lost upper limb function but who has reasonable lower limb function. The device is a purely mechanical system which translates four independent foot

and leg movements to a mechanism operating at table top level. This unit enables the patient to regain a degree of independence by performing such tasks as self-feeding, typing, shaving, and other personal needs.

Environmental Control

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Sponsor: *None Listed*

Purpose—The "Swift" system has been developed to enable the severely disabled to operate remotely a number of electrically powered devices, including a telephone, by means of a small portable transmitter. A wide range of input controls are available to meet the specific

needs of the patient. "Swift" is at the moment undergoing a 6-month comparative trial together with the "BEC 1" environmental control. Both systems are to be used by patients who have had no previous experience of operating this type of equipment.

Evaluation of Rehabilitation Technology

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Sponsor: *National Institute of Handicapped Research*

Purpose—The SWRI-REC emphasizes research efforts relating to the development of strategies, procedures, and criteria for evaluation of new rehabilitation products and clinical techniques. These efforts also include the study of requirements for acceptance by cognizant regulatory agencies. Evaluation activities conducted or managed by the SWRI-REC staff combine elements of engineering test and analysis for safety, reliability, and maintainability; informal user field trials to check appropriateness and sample potential functional problems; and longer-term, formal clinical evaluation. A team approach to evaluation allows use of the diversity of engineering expertise that resides in the SWRI staff and the clinical support of the Southwest Research Consortium which includes the University of Texas Health Science Center in San Antonio. To identify particular problems

associated with evaluation and in order to gain experience that will contribute to the development of effective models, the REC solicits experimental/prototype products and technological devices from the rehabilitation community (both government-funded and commercially developed items).

Progress—REC activities have included engineering analysis and clinical evaluation of the Stanford Storable Crutch; wheelchair static loading tests conducted to prove draft testing methods proposed by the International Standards Organization; various demonstration evaluations to examine the validity of evaluation models; organization and management of a site visit team effort to determine the commercialization-readiness of a particular product; and some commercially-sponsored evaluation activi-

ties. Plans are in progress for a two-center clinical study of a Yugoslavian-developed functional electrical stimulation device for treatment of incontinence in women. An engineering and acceptance test procedure has already been developed and will be conducted prior to clinical investigations. Dissemination of program information has continued through the distribution of the Center's *TechEval* bulletin and additional publications, participation in conferences

and exhibits, visits to various resource organizations, and responses to numerous information requests.

Future Plans—Efforts to develop and refine evaluation plans and methods that will enhance product commercialization processes will continue. In addition, the Center will seek innovative applications for evaluation frameworks in the rehabilitation community.

Arm-Powered Bicycle for the Disabled

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Once the basic living needs are attended to, mobility and recreation become paramount to the complete rehabilitation and societal integration of an individual with a lower limb disability. Whether for recreation, sport, therapy, or self-powered transportation, bicycling is a popular activity providing many physical, psychological and social benefits. and bicycling is potentially as natural and revitalizing for the physically challenged as it is for the able-bodied. The availability of an arm-powered bicycle would extend mobility and exercise beyond wheelchairs to offer the dignity, the control, and the exhilarating freedom through movement associated with balancing and riding a bicycle.

Several companies market tricycles for children and adults, including an attachment which converts a wheelchair into a tricycle. The first arm-powered bicycle began as a VA sponsored student project in the Stanford University Mechanical Engineering Design Division during the 1979/80 school year. Development of successive prototypes continued at the RR&D Center, culminating in three distinct models: adult, child, and touring/racing. The arm-powered bicycle features drive, steering, and power input at the hand cranks. Adjustable

side casters smoothly touch down at the desired lean, and also fasten down for four-wheel maneuverability indoors. An optional folding crank tower facilitates transfer to and from wheelchairs.

Progress—The approach has been to design, build, and test successive prototypes, incorporating improvements, evaluating alternative configurations, and enhancing the manufacturability of the design. The fourth version, a pre-production prototype called the Para-Bike, was completed in Autumn 1982.

In Spring 1983, a company called Recreational Mobility, located near Eugene, OR, was incorporated to begin production of the Para-Bike. The product was renamed the Handbike, and three improved versions were marketed. Recreational Mobility is no longer producing the Handbike. However, a *Technology Transfer Manual* is currently being prepared at this RR&D Center to facilitate production of the Handbike by other potential manufacturers. New layout and detail drawings are near completion, using the computer-aided design facilities at the Stanford Center for Design Research. The drawings will be included in the *Technology Transfer Manual*.

Tandem Bicycles for Disabled and Able-Bodied to Ride Together

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Individuals with physical disabilities resulting from paraplegia, low level and incomplete quadriplegia, amputation, muscular dystrophy, multiple sclerosis, stroke, cerebral palsy, blindness, etc., who are endeavoring to live healthy and meaningful lives, can benefit greatly in their physical, psychological, and social well-being from participation in popular recreational activities.

A Tandem bicycle for individuals with and without disability would literally provide a vehicle for integrated mobility and recreation. On such a tandem, many who have been excluded from the revitalizing activity of bicycling will experience the freedom, exhilaration, and accomplishment of riding on two wheels.

As a spin-off from the development of the hand-propelled single-rider vehicle known as the Handbike, there is now a two-person version. A prototype of this first tandem bicycle for disabled and able-bodied to share, called the Handbike Tandem, was completed in June, 1983. The Handbike Tandem is, conceptually, a merging of a Handbike and a standard bicycle. In the interest of rider independence and equality, the tandem is designed so that it can be ridden by one rider alone in either the front or rear position.

Progress—The experience gained from the Handbike and the Handbike Tandem has led directly to the design of the new prototype called the Sunburst. Completed in June, 1984, it is designed to provide the physically-challenged with the many benefits of tandem bicycling.

Although similar to the Handbike Tandem in rider configuration, the Sunburst combines arm- and foot-powered recumbent cycling in the front with a standard bicycle arrangement in the back. The back rider steers through a

remote linkage from the handlebars to the front wheel, and pedals in a standard bicycling posture. The front rider sits in a recumbent position and powers with any combination of arms or legs. Both riders have a clear view ahead and find it easy to converse. The front cranks directly couple, allowing the front rider to assist or passively exercise his or her own less functional limbs. A freewheeling system allows the front rider to rest while the back rider continues to pedal and for those who prefer not to move their legs, a leg-rest attaches to the seat, so if a rider is unable to pedal at all, he or she may just go along for a ride. When the Sunburst comes to a stop, the front rider can lower a secure kickstand.

The front drive system and seat may be detached, yielding a single-rider bicycle. And to increase the market potential and to provide greater dignity for the disabled rider, the front position has been designed to appeal to able-bodied riders as well.

Future Plans—A *Technology Transfer Manual* is being prepared, documenting the tandem development, to facilitate transfer to potential manufacturers. Layout and detail drawings of an improved Sunburst II will be included. Nearing completion, these drawings have been generated using computer-aided design facilities at the Stanford Center for Design Research. Further performance and mechanical evaluations are needed to help assure that the most worthy tandem product will be available. In addition, collaboration is continuing with the builder of the Counterpoint (Counterpoint Conveyance Ltd., Seattle, WA), a similar tandem developed independently of the Sunburst. The intention is to combine the best of both designs.

Information Technology in Rehabilitation Engineering

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Sponsor: *None Listed*

Progress—We have acquired an IBM look-alike computer with appropriate communications software to enable access to many rehabilitation systems now available. Important systems which are now accessible are: 1) ABLEDATA, a database on equipment for disabled people which is accessed through the Australian Overseas Telecommunications Commission system called MIDAS; 2) CONFER, an overseas information sharing system which is also accessed through MIDAS; 3) MINERVA, an Australian mailbox system with International and National Telex access; 4) DISCOM, a disability communication system operated by Prahran College of TAFE in Victoria (currently accessed by an STD phone call but soon to be accessible throughout Australia via AUSTPAC for the cost of a local telephone call); 5) Videotex Sys-

tems e.g. VIATEL, which gives access to banking, shopping, booking, etc.

The ability to download to and upload from a portable lap computer is also of importance in doing work at home. The future computerization of the information on equipment held in Independent Living Centres in Australia will be an important development.

In addition to the greatly enhanced information sharing available to rehabilitation professionals as a result of these developments, people with disabilities will benefit directly. A person without keyboard skills and unable to speak (i.e., unable to use the telephone) and perhaps unable to move easily outside their own home will have access to all of the above systems from home using an Apple IIe computer and Adaptive Firmware Card.

Technology to Enhance Independence of Physically Disabled School Children

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Sponsor: *None Listed*

Purpose—A recent study has shown that the majority of children at the Regency Park Centre Special School experience problems with classroom skills, toileting, and mealtime activities which could be overcome by the application of appropriate technology. Our aims include: 1) investigation of the needs established in our earlier study of classroom independence, with a view to deciding whether the problems can be solved by commercially available technology, or modifications to existing products, or whether a new design is needed; 2) purchase of products which are available, and designing, building, and providing new solutions where necessary; and 3) measuring the extent to which the disabled child's independence has been enhanced by the application of new technology.

Progress—In the preliminary phase the priority problem areas established in our earlier study will be investigated. Where problems have ready-made solutions, those solutions will be implemented. Design guidelines will be established for the new designs which need to be developed. Priority will be given to the most cost-effective implementations of highest incidence. Toileting has been identified as an area of particular concern and importance, and our initial work will concern more independent and hygienic toileting. In the concluding phase followup measurements will be taken regarding the level of independence exhibited by children who have taken part in this project, in order to determine to what extent skills deficits have been compensated and independence has been enhanced through technological solutions.

Future Plans—This project will have an industrial designer working with the existing staff of doctors, engineers, teachers, therapists, nurses, and assistants to design and implement solutions for the problems we have identified that have high incidence and technological solutions. The expected outcome is that the children will be made more independent with cus-

tomized technological support, to the extent that some of them will be able to attend regular schools. The project will demonstrate how the introduction of technological innovations for physically disabled children in special schools and mainstream schools can improve the quality of their educational achievement.

Supported Employment

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Sponsor: *Commonwealth Department of Community Services*

Progress—This project functions to give intensive training and support that will enable 15-20 unemployed severely disabled adults to participate in employment which is satisfying and provides for an equitable wage structure related to their work. S.A. Group Enterprises has

been established as a new joint venture initiated by Bedford Industries, Crippled Children's Association, and Minda Incorporated, and funded by the Commonwealth Department of Community Services, initially as a 12-month demonstration project commencing July 1986.

Rural Rehabilitation Technologies Database

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Sponsor: *The Otto Bremer Foundation*

Purpose—Rural areas offer unique challenges to both the rehabilitation practitioner and the disabled individual. The development of rehabilitation technology traditionally takes place in "urban" centers. Meanwhile, "back at the ranch" individuals are developing their own solutions to problems they face daily. Each could benefit from the experiences of the other, and fellow consumers could benefit by not having to "reinvent the wheel" for themselves.

The purpose of this project was to catalog innovations, inventions, and ideas to benefit disabled persons living in rural settings. Work began in January, 1985; and the initial development of the projects has been completed. An update is planned for the winter of 1986.

Progress—A wide assortment of information was submitted and compiled into a 175-page

catalog. The catalog contains 100 entries in the area of "do-it-yourself" commercial products and resources. A Concept Paper section contains papers regarding "low-cost technology," computer databases, information centers, and the rural blind. The Future Plans section includes a registration form to be used by readers to submit ideas for future editions.

Requests for the catalog have been received from over 450 individuals, manufacturers, facilities, and organizations. These requests represent 47 states, the District of Columbia, six Canadian provinces, England, France, and India.

Future Plans—An updated version of the catalog will be developed and distributed to those who received the first edition and to those who sent requests after our supply was exhausted.

Interpersonal Problem-Solving by the Mentally Ill: Video-Assisted Technology for Training Social Skills

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—The purpose of this project is to develop a videotape-assisted package for training veterans with psychiatric disorders in coping effectively with difficult interpersonal situations. The package is to consist of a videotape, a therapist's manual, and a patient's handbook. The training method is based on procedures from social skills training methodology, and the materials will be highly structured and detailed so that professional and paraprofessional staff in a variety of psychiatric rehabilitation settings can deliver the training.

The training will help patients to identify and articulate interpersonal problems, to generate possible alternative solutions, and to choose an effective solution to the problem. The training will also help patients to competently perform the solutions by learning how to use appropriate verbal and nonverbal social skills.

Progress—Progress has been made on the project to the point that a detailed script of the

final videotape has been completed, and production of the videotape will begin soon. A preliminary videotape has been completed, using a small sample of patients to test the procedure's effectiveness in helping the patients to acquire the targeted skills. Preliminary versions of the manuals have also been completed and are currently being revised for the final version.

Future Plans—Plans for the coming year include the production of other modules relevant to competent independent living (e.g., effective conversational skills, grooming, etc.). In addition, plans are under way to adapt the interpersonal solving module for use with veterans who have spinal cord injuries. It is hoped that, although the content needs of the module may be different for physically disabled veterans, the procedures we have originally developed for use with psychiatrically disabled veterans will be as effective for different populations.

Computerized Treatment of Acquired Reading Disorders

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Normal reading is dependent upon the integrity of at least two routes or functional systems, the phonological route and the lexical route. Dysfunction of either route results in alexia. The objective of our project is threefold: to develop therapy tasks suitable for improving deficient reading strategies associated with the lexical route or the phonological route; to develop computer programs for an interactive computer that would provide the patient with self-paced practice on the above tasks; and to assess the efficacy of these treatments when presented via computer interaction.

Progress—Each patient receives standardized pre- and post-therapy testing. Patient progress on each of the 6 tasks of therapy is monitored daily. Twelve subjects will be tested: 6 with deep dyslexia and 6 with surface dyslexia. Six tasks are presented to each patient in each subject group (3 directed at remediating the lexical route and 3 for the phonological route) during a total of 26 sessions. The tasks are presented via IBM PC/XT; and patient's responses are scored, analyzed, and stored on the computer. Five subjects have participated in the treatment thus far; however, none of the data will be analyzed until all 12 subjects have completed the project.

Therefore, no findings, results or conclusions are available.

Future Plans—Our goal for this research is to

develop computer programs for tasks of greater complexity for higher level alexic patients. Additionally, we hope to write programs for agraphic patients using a similar paradigm.

A Program for Evaluating the Dysvascular Patient

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—The purpose of Project I is to evaluate the role of lumbar sympathectomy in the management of patients with arteriosclerotic occlusive disease of the lower limbs. The purpose of Project II is to develop inexpensive and dependable instrumentation that is also reliable to clinically evaluate patients with vascular disease.

Progress—Project I. The role of lumbar sympathectomy in the management of patients with arteriosclerotic occlusive disease of the lower extremities remains a subject of considerable discussion. Much of the confusion concerning lumbar sympathectomy is due to a lack of procedures to accurately and sensitively select those patients in whom lumbar sympathectomy may be of benefit.

We have carried out a retrospective review of 101 lumbar sympathectomies to examine the role of a distal thigh (above knee)/arm systolic pressure index in selecting patients for lumbar sympathectomy. (Previously, we have established criteria using Doppler systolic ankle pressure, ankle-to-brachial systolic pressure ratio, external magnetic flowmetry measurements of peak pulsatile calf blood flow, and thermistor thermometry in selecting patients for lumbar sympathectomy.)

Preliminary Results—Of the 101 lumbar sympathectomies, 11 were excluded due to concomitant direct arterial surgery or being lost to followup. Data presented are thus based on 90 lumbar sympathectomies done on 82 male patients. Beneficial effects from lumbar sympathectomy were the relief of symptoms, the prevention of major amputation, or improvement

in disabling intermittent claudication. In these patients it was found that a Doppler systolic above knee/brachial pressure index of 0.60 or better, and an external magnetic flowmetry mean calf blood flow of 30 ml/min or greater, was found to be a good predictor of a beneficial effect from lumbar sympathectomy. These data are currently being prepared for publication.

Progress—Project II. Instrumentation being investigated is based on hydrogen clearance for perfusion measurement, tissue mechanical properties measured quantitatively by indentation, and cutaneous perfusion photoplethysmography for observing perfusion response to changes in tissue pressure. This work has focused on assessing peripheral vascular occlusive disease, chronic venous insufficiency, and tissue viability in pre and post-surgical patients.

Peripheral vascular occlusive disease is being evaluated by measurement of cutaneous perfusion pressure. A technique for local measurement of cutaneous perfusion pressures (CPP) has been developed which utilizes photoplethysmographic measurement during local pressure application to the skin. A total of 225 limbs have been studied to evaluate the usefulness of the method in detecting peripheral arterial disease and in differentiating disease severity. In a further study of 11 prospective amputees, CPP measurements were taken to determine the usefulness in evaluating amputees.

Preliminary Results—A significant decrease in CPP from the chest to the dorsum of the foot was seen in limbs with arterial disease, where the disease was evidenced by intermittent claudication, rest pain, and/or gangrene. The re-

sults indicate that the technique can successfully identify the presence of peripheral vascular disease, distinguish among different levels of severity, and aid in determining the optimal level of amputation consistent with wound healing. It can also assist in following the patient's course after reconstructive vascular surgery.

With respect to chronic venous insufficiency, one finds that it often impairs patient mobility, but that it is difficult to assess due to the lack of objective, noninvasive, and routinely useable clinical tests. To improve assessment, we have developed a test for quantitative measurement of venous reflux and for separate identification of deep and superficial involvement. The test is noninvasive and requires minimal patient cooperation. The total venous reflux measurement system uses an inflatable boot placed over the lower limb from foot to below the knee, in the seated subject. The boot is inflated to 60 mm Hg., and calf volume is measured by impedance plethysmography when the boot pressure is abruptly released, allowing blood to return to the limb. Changes in impedance with time measure the rate of change in

volume and therefore blood flow. To obtain a separate measurement of deep venous reflux, a tourniquet is placed above knee to impede flow through the superficial system, and the test is repeated. To calculate superficial reflux, one subtracts deep reflux from total reflux.

Evaluation of the method was carried out in a series of 89 limbs. A grouping of 35 limbs according to venography findings showed that the test of total reflux provided a differentiation of patients according to the presence of primary and/or secondary varicosities. The superficial reflux measurements provided a further differentiation of patients afflicted with primary varicosities.

Future Plans—Other studies under development and in progress relate to the measurement of perfusion with the use of fluorescein fluorometry and noninvasive hydrogen clearance. This work is proceeding in animal studies of bowel function as related to perfusion and in approaches to fluorometry which reduce risk of patient reaction to dye administration.

Training Schizophrenic Patients in Medication Management

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Previous studies have indicated that skills training procedures can be an effective approach to treating patients with chronic mental illness. The Rehabilitation Medicine Service at the Brentwood Division of the West Los Angeles Veterans Administration Medical Center, in conjunction with the UCLA Department of Psychiatry and Camarillo State Hospital, has been developing and evaluating a highly structured (modular) approach to skill training. A series of modules, each composed of a trainer's manual, a demonstration videotape, and a patient workbook, are in varying stages of development and production. One of these, the Medication Management Module, has been evaluated in the Social and Independent Living Skills program at the Brentwood Veterans Ad-

ministration Medical Center.

Progress—At the present time, a study is being conducted to determine whether mental health professionals working in a diversity of settings can learn to use the module with minimal training and supervision. This question is currently being addressed in a large-scale field test of the module throughout the United States and Canada. The primary objective of the field test is to document the efficacy of the module, with a large number of patients taking neuroleptic medications, before the module materials are disseminated on a nationwide basis. Currently in progress, the field test is expected to yield information regarding user-friendliness, trainer competence, and impact on patient

knowledge of, attitudes toward, and use of antipsychotic drugs.

Additionally, questions related to the amount of training required to attain minimal levels of trainer competence will be answered.

Twenty-eight field test sites have been randomly assigned to each of two conditions (training plus consultation versus consultation alone). The sites represent a wide geographic distribution and a broad range of inpatient and partial-hospitalization programs located in public and private psychiatric hospitals, community mental health centers, and residential care facilities. Expert consultation has been available by telephone throughout the field test for all sites.

In the field test, therapist competency is measured in three domains: knowledge of module content and procedures (cognitive mastery); the ability to accurately and consistently follow procedures specified in the therapist's manual (behavioral mastery); and the ability to assess a patient's progress accurately.

The impact on patients participating in the field test is evaluated in three domains: compli-

ance, knowledge, and skills.

Preliminary Results—Preliminary findings suggest that medical practitioners and others in the Allied Health profession find the module materials and training procedures relatively easy to use and effective with patients. The prescriptive nature of the trainer's manual combined with the availability of expert-consultation, has made it possible for users to implement the module procedures without the benefit of extensive training. It should be noted, however, that a fidelity study suggests that some training may be required to achieve an expert level of proficiency.

In terms of the impact that the Medication Module has on patients participating in the study. Results from the first field test sites to complete the study portend significant gains in cognitive mastery and a relatively high level of skill attainment among patients. Results related to medication compliance and skill maintenance in patients must await the followup phase of the study.

Training Chronic Mental Patients in Social and Independent Living Skills

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Sponsor: VA Rehabilitation Research and Development Service

Progress—For more than 4 years, the Rehabilitation Medicine Service in the Brentwood Division of the West Los Angeles Veterans Administration Hospital, in cooperation with the UCLA Department of Psychiatry and Camarillo State Hospital, has been developing and evaluating the Social and Independent Living Skills series of highly structured training modules to teach social adaptation and foster rehabilitation in chronic mental patients. The modules are being designed to be used as part of a comprehensive treatment program that includes antipsychotic drugs, family therapy, and case management.

The modules provide detailed, step-by-step instructions, and can be used by health care professionals who have experience working

with patients with chronic mental illness. The trainer or therapist teaches the skills using a combination of videotaped demonstrations, focused instructions, specialized roleplays, social and videotaped feedback, and practice in the patient's natural environment.

Patients with schizophrenia or other chronic disorders can learn needed skills with these training strategies. A number of studies carried on during the past decade in the United States, Italy, and Switzerland indicate that patients who receive training in social and independent living skills demonstrate improved social adjustment and have fewer relapses.

The modules are being developed and evaluated by an interdisciplinary team of clinical researchers and rehabilitation specialists. Ulti-

mately, 12 modules will be produced. The modules, which are in various stages of design and production, include: Medication Management; Leisure and Recreation; Selfcare and Grooming; Conversation Skills; Symptom Management; Social Problem Solving; Friendship and Dating; Food Preparation; Money Management; Home-finding; Transportation; and Using Community Agencies.

Each module provides a highly prescribed protocol with three components: a trainer's manual, which contains both a comprehensive overview of the module and instructions sufficiently detailed to enable quick assimilation and use; a videotape, which demonstrates the desired behavioral skills for patients; and a patient's workbook, which provides reinforcement for the contents of the module and documents the patient's participation.

Preliminary Results—The first module to be produced, Medication Management, is presently available through McNeil Pharmaceutical. Trials of this module have shown remarkable success. Improvement from baseline scores (mean percent of behavioral skills observed in roleplay tests) ranged from 37 percent to 65 percent after training; erosions of only 7 percent to 12 percent in skills were noted at 3-

month followup assessments.

In other controlled trials of the problem-solving method of teaching social skills, improvements persisting for as long as 2 years were documented. Since these evaluations were made at places and times apart from the training sessions, these results indicate durability and generalization of the knowledge acquired.

The Medication Module is presently being field-tested in 30 hospitals and mental health centers throughout the United States and Canada. It is published in final form and ready for distribution.

The Leisure and Recreation Module was evaluated in the Social and Independent Living Skills Program in the Rehabilitation Medicine Service at Brentwood VA Hospital and will be field-tested during the coming year.

The Symptom Management Module is nearing completion and will be formally evaluated in the Social and Independent Living Skills Program in the fall of 1986.

Future Plans—Other modules scheduled for completion during the next year include Self-care and Grooming and Social Problem Solving. With continued funding, 2 modules per year will be readied for dissemination until the entire series is completed.

Dissemination of Rehabilitation Technologies

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Although we often read about new technologies being applied to or developed for use by disabled individuals, relatively few such technologies ever result in a specific rehabilitation product, and fewer high-technology products are available to the disabled community at large. The reasons for this situation are complex and have not been studied in depth.

It is clear that even well-designed devices developed for use in the disabled community suffer from a number of factors which mitigate against their successful dissemination to the end user. From a commercial point of view, the

market is small, the devices are often expensive, and most of the potential users do not have much money to spend. Consequently, costs must usually be recovered from third party payers, which introduces certain bureaucratic complications.

The central hypothesis of this study is that user acquisition and utilization of innovative rehabilitation technology could be improved if the system which researches, develops, manufactures, delivers, and maintains that technology were better understood. It is expected that this increased knowledge would permit identifi-

cation of factors in the rehabilitation technology transfer process that can be modified in order to facilitate the delivery of rehabilitation technologies to targeted populations.

Progress—A contract was awarded by the Veterans Administration to American Institutes for Research (AIR) in the Behavioral Sciences, in early January, 1986. The contract calls for a study of the problem from a viewpoint that is alert to opportunities for developing appropriate strategies for the successful dissemination of rehabilitation technologies.

Meetings have been initiated between technical staffs of the Institutes and the Rehabilitation Research and Development Center, and the program will be carried out as a joint effort. Questionnaires are now being formulated as the first step toward studying selected rehabilitation devices which have or have not been successfully disseminated to the intended users with various disabilities.

Future Plans—In its initial stages, researchers will seek to identify instructive examples from

the history of rehabilitation technology transfer. A case study approach will be used to investigate these examples: questionnaires will be generated for evaluators, trainers, and users; interviews will be conducted with principals; and original documentation will be sought. On the basis of these studies, investigators will attempt to identify the factors that facilitated the successful transfer of technology, along with those that hindered. A comparison of the case studies will provide a list of common problems, together with a suggestion list of strategies for dealing with them.

The second stage of the project is expected to involve attempting to validate these strategies, and to prioritize them according to feasibility and effectiveness. This will require implementation of partial strategies, where possible, through collaboration and interviews with current researchers, manufacturers, trainers, third party payers, and others.

In the third year, findings from this work will be published in monograph form, available for distribution to interested parties.

Development of a Life Satisfaction Scale Applicable for People with Severe Disabilities

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Sponsor: *Veterans Administration Rehabilitation Research and Development Service*

Purpose—This study seeks to develop a clinically useful structured interview that will provide insight into the adjustment process of people with various disabilities. The goal is to refine the structured interview into a quick, inexpensive, standardized clinical assessment device that will measure the perceived life satisfaction (quality of life) and coping skills of people with a variety of severe disabilities. We will also attempt to validate the structured interview with a longitudinal study of individuals enrolled in several different inpatient rehabilitation programs at the Palo Alto VAMC (Western Blind Rehabilitation Center, Spinal Cord Injury Center, and Rehabilitation Medicine Services), and with a matched comparison sample of non-

disabled veterans.

Work on this project began in 1984 when the principal investigators developed a preliminary version of the structured interview, based on several adjustment scales currently in use in various rehabilitation settings. That preliminary version represented a substantial improvement over other assessment devices in that it was designed for general use with any disability group, it included measures of actual behavior and activities of daily life, and subjective appraisals of quality of life were directly solicited. The structured interview was dubbed 'The ACCESS Questionnaire' (Assessment of Current Community, Emotional, and Social Satisfaction) and administered (at intake, discharge, and 6

months post-discharge) to a pilot sample of 30 individuals undergoing blind rehabilitation.

Progress—The ACCESS Questionnaire has gone through two revisions since the first pilot version was tested. Ninety patients at the WBRC completed all 3 assessments (intake, discharge, and follow-up) with the first revised form, and preliminary analysis of the data from those individuals led to a second revision of the questionnaire, which is now in use at all three rehabilitation centers. To date, the Access Questionnaire has been administered to well over the planned 100 patients at the WBRC. New patients are no longer being routinely included in the study because we project that continued follow-up should yield more than 150 patients. However, we are continuing to include all women and members of racial minority groups in order to increase their representation in our sample.

Because of a delay in the planned expansion of the Spinal Cord Injury Center, we have obtained only about 25 percent of the number of these patients we had anticipated. Efforts are underway to expand our sample of spinal cord disabled individuals by cooperating with the Spinal Cord Injury Unit at the Santa Clara County Valley Medical Center. We have also collected only about 25 percent of the planned number of individuals from the general Rehabilitation Medicine Ward. However, we have already administered the Access questionnaire to 116 nondisabled veterans, and to about 33 percent of the planned number of 5-year-posthabilitation samples.

Preliminary Results—Preliminary analyses of the data are under way, and there are several interesting tentative findings. First, it is clear that patients undergoing rehabilitation at the project centers report a significant improvement in their life satisfaction over the course of their stay (the percentage reporting only fair or

poor life satisfaction decreases from about 35 percent to under 20 percent, and the percentage reporting very good or excellent life satisfaction increases from about 30 percent to more than 50 percent).

Second, these improvements in overall life satisfaction are maintained with little or no deterioration throughout the 6-month period following discharge from the rehabilitation center.

Third, although the quality of life of our disabled subjects improves considerably as a result of their rehabilitation, it remains significantly lower for many of them than the quality reported by our non-disabled matched comparison sample of VFW members (only 7 percent of whom report poor or fair quality, while more than 60 percent report very good or excellent quality).

It is encouraging to note that a separate study of the reliability and interjudge-agreement of our project interviewers establishes that it is possible to obtain very high reliability with the ACCESS Questionnaire. The mean intercorrelation (r) across the quantitative items on the questionnaire was .78, and the overall percentage agreement across all items and all raters was 79.4 percent (an additional 19.1 percent were only off by 1 point on a 5-point scale).

The ACCESS Questionnaire is currently also being used at the Low Vision Clinic of McGill University in Montreal, and at the Eastern Blind Rehabilitation Center in West Haven, Connecticut.

Future Plans—In the coming year, we will work to complete our samples of disabled individuals, and will proceed with a planned effort to develop subscales of the ACCESS Questionnaire that are clinically relevant, theoretically interesting, and that furnish reliable indices of various discrete aspects of the quality of life of disabled individuals. We will also continue to share the efforts of our work with the broader clinical and research community.

Rehabilitation of Neurogenic Communicative Disorders in Remote Settings

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Many patients who suffer neurogenic communicative disorders reside where services are not readily available. Either these patients are not managed, or they must travel long distances to receive services, or they must remain or become inpatients for extended periods to receive services. Developing a means to deliver services in remote settings would provide management for patients who currently do not receive it; reduce the inconvenience and cost of travel; eliminate the necessity and cost of hospitalization; eliminate the cost of contracting services from private practitioners; and eliminate the high expense of developing additional classic treatment programs.

Progress—We are conducting an investigation designed to determine whether an existing appraisal and treatment center can utilize technology to provide management of neurogenic communicative disorders in patients who reside in remote settings. Three appraisal conditions are being compared: traditional face-to-face evaluation; appraisal in a closed-circuit television condition where the patient and clinician can see and hear each other; and appraisal in a telephone condition where the audio signal is

transmitted through speaker-phones; visual stimuli are sent over a phone line and displayed on a touch-sensitive video screen connected to a computer-controlled video laser disc, and writing is transmitted over a phone line and reproduced by a TELENOTE transcriber.

Patients participating in the appraisal study display aphasia, dementia, dysarthria, apraxia of speech, and combinations of these disorders. In addition, a treatment trial is being conducted with aphasic patients who meet selection criteria. Patients are assigned randomly to one of three conditions for treatment: face-to-face, television, or video laser disc.

The investigation was initiated in July 1984 and is designed to be completed in July 1987. Currently, data are being collected in the VA Medical Center, Martinez, CA, where we are simulating delivery of services in remote settings.

Future Plans—If the initial results are positive, the investigation will be replicated in a field test in two VA Outpatient Clinics where management of neurogenic communicative disorders is not available.

A Manual for the Development of a Program in Rehabilitation Medicine in a Ghetto Hospital

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Sponsor: Columbia University College of Physicians, with Harlem Hospital Center

Purpose—The Department of Rehabilitation Medicine at Harlem Hospital plans to publish a manual of instruction on the development of a rehabilitation program in an urban setting for the deprived and the poor.

The Department now has at least seven programs for students in multiple disciplines of Rehabilitation Medicine, including a training

program for physicians and one for health workers from the community. The goal is to provide a didactic multidisciplinary methodology for the building of a rehabilitation program from the moment of funding.

Progress—The program manual is divided into six sections dealing with the ecology of poor

areas, the physical modalities and the peculiar methods or patterns of administration necessitated by the needs of the client population; the sociology of poverty and psycholinguistics problems encountered in the population surrounding a hospital providing care to a deprived minority; and restorative care to the impaired child in an urban setting.

An instruction manual of this sort requires an extensive description of nursing in its multiple roles within a health facility.

The manual ends with an extensive de-

scription of electrodiagnostic problems (drug neuromyopathy, sequelae of trauma, neurological disorders resulting from infections) that should be anticipated. Although multidisciplinary in its target student population, the manual closes with instructions addressed to the physician on how to play the advocate role.

The text is provided in a hardcover ring binder that permits students to insert the notes and loose material distributed in various sections, through which they rotate.

Diabetic Neurotrophic Ulceration: Screening and Prevention Utilizing Aesthesiometry

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Sponsor: VA Rehabilitation Research and Development Service

Purpose—Development of neurotrophic ulceration in the diabetic patient leads to amputation of limb and disability of these patients. Currently, most information and effort is directed at treatment of the already formed neurotrophic ulceration. Information is known on prevention, but effective methods for quantitating the overall status of the diabetic foot are lacking. New criteria are needed for the variables which cause ulcer formation. This study will focus on peripheral neuropathy and its relationship to the diabetic's loss of protective sensation leading to ulceration.

It is proposed that Semmes-Weinstein aesthesiometry measuring cutaneous touch pressure sensation could be an effective, practical method for quantitating the extent of peripheral neuropathy in the lower extremity of diabetic patients. New criteria utilizing aesthesiometry can be established that can assist in the diagnostic process to predict the relative risk of development of neuropathic foot ulceration in the diabetic population.

This project will follow 100 diabetic patients divided into three risk groups of equal size: low, medium, and high on the basis of cutaneous touch sensation. These patients will be followed with noninvasive screening tests 3 times annually, in addition to their regular rou-

tine foot care.

This proposed project is a survey of a patient population; no alterations in patient treatment will be done. The screening tests will include cutaneous sensation testing, a photograph of the plantar surface of the foot to document lesions and foot structure, and completion of a history/physical questionnaire which will be used as a database.

The database will be analyzed by Clinfo statistical packages on the station-wide PDP 11/24 computer, especially noting changes in cutaneous touch sensation and occurrence of ulcerations. Data will be evaluated to determine if cutaneous sensation is an effective parameter for division of risk groups. Each group will be evaluated to determine what other variables cause differences within the group. In addition to determining the efficacy of aesthesiometry in quantitation of peripheral neuropathy, this analysis of the database will provide a clearer understanding of the variables of ulcer formation as related to peripheral neuropathy.

Clinically, this information can be used to enable one to intervene with appropriate treatment or preventive measures to control or prevent occurrence of diabetic neurotrophic pedal ulceration.

Thermographic/Spectroscopic Comparison of Soaks, Exercise, and Trental™ on Diabetic Feet

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Sponsor: *Rehabilitation Research and Development Service*

Purpose—Diabetic foot ulcers, through infection and nonhealing, cause significant disability and limb loss in an expanding diabetic population. Multiple factors, i.e., vascular insufficiency, neuropathy, metabolic abnormalities, and structural deformity, have been investigated as contributing to tissue breakdown in the diabetic foot. However, the relative role of each of these factors is unclear. Thus far, no specific criteria have been established to assess the progress of diabetes-related foot diseases. It would seem both financially and medically prudent to develop noninvasive diagnostic tests to identify patients who are “at risk” of ulceration in order to facilitate the earliest medical intervention.

The objective of this project is to delineate any thermographic or spectroscopic differences within the diabetic population that could be used to screen out patients “at risk” of ulceration.

Future Plans—Using liquid crystal thermography and magnetic resonance spectroscopy, this project will study vascular reactivity in skin and the level of ischemia in muscle in the face of various therapeutic maneuvers. This project will evaluate 40 patients equally divided

into 4 population groups. Each patient will be interviewed, and a standard questionnaire covering pertinent medical history will be administered along with a physical examination of the foot. Based on this information, patients will be placed in one of four study groups: 1) nondiabetic controls; 2) diabetic patients with no prior history of foot ulceration; 3) diabetic patients with a prior history of foot ulceration but without active foot ulcers; and 4) diabetic patients with active foot ulceration.

Thermographic evaluation of all patients will be completed before and following three different therapeutic maneuvers: 1) exercise; 2) uniform warming; and 3) an 8-week therapeutic trial of Trental™. Magnetic resonance spectroscopy will be completed on a smaller set of patients distributed among the groups, but evaluating only exercise and Trental™.

The database will be analyzed using the Clinfo statistical package to determine how one population differs from the other and how exercise, warming, and Trental™ affect thermographic and spectroscopic patterns. It is hoped that this information will aid in the development of a prospective index in the overall assessment of the diabetic foot.

Development of a Sensory Substitution System for the Insensate Foot

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Sponsor: *VA Rehabilitation Research and Development Service*

Purpose—The main objective of the research is to develop a practical sensory substitution system for the foot.

In the first year, we will develop an excitation and amplification system for the chosen commercially-available pressure transducer. We will work out the mechanism for installation of the transducers into a silicone rubber insole.

Hardware and software for a microcomputer signal-processing system will be developed to acquire the pressure data, process it, and use it to drive a display system, which will be a modified commercially-available device. Spatial sensitivity of the pressure transducer and electro-tactile display will need to be measured. A radiotelemetry system will be developed.

When we are satisfied that the design and function are correct, we will construct trial systems for evaluation. The systems will be tested by using 2 normal subjects. Normal subjects are being used to test the durability of the system and the usefulness of the data acquired. It is projected that at least 1 of the normal subjects will be 1 of the investigators.

During the second year, utilizing data from the initial clinical evaluation, we will improve the electronics for a lower power, more compact system; write additional software for signal processing; and build 4 additional systems for clinical evaluation. Especially valuable will be the feedback regarding the subject's ability to interpret the information.

During Years 2 and 3, 4 patients with insensate feet will be used to evaluate the device. High risk patients from the Podiatric Medicine Clinic with additional biomechanical risk factors will be chosen. They will represent the insensate foot with a plantarflexed second metatarsal, with forefoot varus, and with plantar-

flexed first metatarsal. One blind diabetic with insensate feet will also be included. With the feedback from these subjects, further development of the microcomputer software will be possible. During the third year, utilizing data from the Year 2 clinical evaluations, we will attempt to simplify the signal processing, modifying the \$5 commercial pressure transducers to lower cost. We will build 4 additional systems for clinical evaluation, evaluating all data to determine if fewer than 7 pressure transducers can provide sufficient sensory feedback. Modifications may be possible in the number and placement of transducers. We will evaluate alternative electrode materials for use in the electrotactile display, seeking a less expensive display system than the current modified commercial system.

Future Plans—The long range goal of this project is the development of a functional, economical, and cosmetically acceptable sensory substitution system.

Information Resources

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Sponsor: *National Institute of Handicapped Research*

Purpose—The Trace Center, which has published an updated version of the Non-Vocal Resource Book, is currently working on the Rehabilitation Resource Book Series, a set of 3 books describing nearly 1000 products available for disabled individuals in the areas of communication, control, and computer access. Each volume also contains reference materials and a variety of application tips relevant to the theme of the book.

Each of the three volumes will include a comprehensive index and cross reference by function, input, and output features.

Progress—The Rehabilitation Resource Book Series will be available from College-Hill Press in the fall or winter of 1986. (A database was generated to store and track product informa-

tion for updates of these books.)

Requests for information received by Trace Center have been handled through a variety of resources. When possible, information is provided through preprinted materials available either through the reprint service or through specially developed information resource sheets. During the past year, information sheets (Trace Quick Sheets) were developed or updated for 16 different areas, and 3 reprint articles were also updated.

When use of written materials is not possible, members of the information project staff answer questions through telephone and written responses.

Future Plans—Monthly 2-hour open houses are held for visitors. These provide information re-

garding center projects and demonstrations of current computer-access and alternative communication methods. Future plans are also described and demonstrated.

Future plans include establishing new

channels of information collection and dissemination, including participation in on-line databases, bulletin boards, and networks. Continued participation in conferences and workshops is also planned.

HSRI Mental Health Strategic Planning and Resource Allocation Model

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Sponsor: Human Services Research Institute

Purpose—The Human Services Research Institute (HSRI) has developed and implemented a microcomputer-based system for mental health strategic planning and resource allocation, the MHPLAN. MHPLAN helps decisionmakers select the most cost-effective mix of services for their mental health system.

The MHPLAN system includes functional level assessment instruments, service planning and cost estimation spreadsheets, manpower planning spreadsheets, and simulation models for projecting service system costs and effectiveness. Input to all system components can be varied to reflect local factors and judgments.

Progress—MHPLAN programs have been developed to work in the context of LOTUS 1-2-3™ software and with most IBM™-compatible hardware. MHPLAN's LOTUS™ context permits information to be readily provided in tabular and graphic form.

MHPLAN has been field-tested with the

chronically mentally ill adult population in a number of states. HSRI is now under contract to develop and apply versions of MHPLAN to children with chronic and severe mental illness and to persons with serious substance abuse disorders. HSRI also has contracts to apply MHPLAN for human resource planning.

Future Plans—In the near future HSRI will adapt MHPLAN for use with the elderly population. HSRI makes the MHPLAN system, including software, available as part of a strategic planning and resource allocation technical assistance consultation. Ongoing consultation is available for 1 year beyond the basic consultation. HSRI is a nonprofit organization that specializes in developing methods and information for planning and evaluating services to persons with chronic and severe mental illness and persons with developmental disabilities. Most MHPLAN funding is derived from contracts with state departments of mental health.

Social Skills Training for Older and Younger Persons with Severe Physical Disabilities

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Sponsor: National Institute of Handicapped Research

Purpose—In the area of rehabilitation services, certain attitudinal barriers between people with disabilities and those with whom they interact may present serious obstacles to the progress of an individual's rehabilitation and to the overall feeling of well-being. In many in-

stances, attitudes of employers, family members and friends may be more crucial to rehabilitation than physical restoration, training, or other services. The current project seeks to provide disabled people with tools they can use to overcome certain types of attitudinal barriers

which they may encounter and to interact more effectively in a variety of social situations.

Becoming disabled frequently entails having to cope with a variety of interpersonal issues. Among these are dealing with negative attitudes, having to request help or refuse unneeded assistance, and making overtures to nondisabled individuals who may be uncomfortable with one's disability. The Social Skills Training Program addresses interpersonal concerns raised by disabled persons of a variety of ages.

Progress—Modeled after assertiveness training programs, the program focuses on specific interpersonal skills which were identified by a panel of disabled persons as being particularly important and/or stressful. The skills are: asking for help, refusing unneeded help; coping with embarrassing situations; establishing new relationships; and job maintenance and advancement skills. These skills were seen as important by a panel of disabled persons in the younger (20-40) and older (45-65) age ranges.

Subjects are recruited and randomly assigned to social skills training or stress management, the alternate treatment. Pre-test, post-test, and six-month follow-up measures include the following: 1) Issues in Disability Scale (IDS); 2) Acceptance of Disability Scale (AD); 3) Adult Self-Expression Scale (ASES); 4) Interpersonal Situations Survey (ISS) (developed by project staff); 5) self-report of interpersonal effectiveness (developed by project staff); 6) IDS sent to people in social support system identi-

fied by trainees.

The instruments are designed to assess outcomes in the areas of attitudes toward self and disability and effectiveness in social situations.

The trainers include disabled persons, as the modeling effect is considered to be critical. The training programs are committed to a training manual, which will be available for dissemination. All sessions are audiotaped and monitored for adherence to the program.

To date, approximately half of the subjects have completed the training at either the Maryland Rehabilitation Center or in the Counseling Laboratory at George Washington University, a community setting. Follow-up assessments have been conducted on one-third of those who completed the training. The sample has included both older and younger persons, as skill acquisition is considered to be important at different stages of an individual's career; and there is a dearth of information on older rehabilitation clients. Preliminary analyses are currently being conducted.

Future Plans—The remainder of the project period will be devoted to completing data collection and analysis. In addition, dissemination of the packages to rehabilitation settings will be conducted. The training program has been designed for use by persons with a wide range of training and could be useful in peer counseling programs in rehabilitation centers, school settings, community settings, and in vocational rehabilitation programs.

Family Factors and Work Adjustment of Handicapped Mexican-Americans

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Sponsor: Field Initiated Research Program, National Institute of Handicapped Research

Purpose—There exists a paucity of quality research describing unique Hispanic cultural factors, such as machismo, la palabra, la familia and overprotectiveness, which influence the vocational rehabilitation process. Over a 36-month period, this south Texas research project will describe patterns of Mexican-American

family interaction, and family member attitudes toward rehabilitation resource utilization for bilingual, bicultural, vocationally handicapped Mexican-Americans.

All handicapped individuals (potential subjects) will have been: 1) mentally stable; 2) eligible for vocational rehabilitation services by the

Texas Rehabilitation Commission; and 3) determined to be bilingual and bicultural prior to selection as a subject. After 3 and 6 months of vocational rehabilitation services, data will be analyzed to identify culturally relevant family predictors of the development of competencies which promote attainment of vocational potential and work adjustment.

Progress—After initial identification by Spanish surname, referral to the study by State agency counselors, and signing a release of confidential information and agreement-to-participate form, a bilingual research assistant administered: 1) the Acculturation Rating Scale for Mexican-Americans; 2) a personal data sheet developed by the authors; 3) the Family Environment Scale; 4) the McCarron Dial Evaluation System; and 5) the Perceptual Memory Task. Each instrument was administered in the preferred language of the subject, English or Spanish. By June 1986, a total of 47 subjects have been initially evaluated, with 31 having been reviewed at a 3 month followup; and 15 of these subjects were reviewed at 6 months. During April 1986, a preliminary analysis of 43 subjects explored the relationship between

Mexican-American level of acculturation, educational level, age, family size, and family interaction patterns. This initial analysis focused only on providing a preliminary descriptive analysis of patterns of family interaction among bilingual, bicultural Mexican-Americans, as provided by the disabled family member. The results of that study were presented at the annual conference of the National Association of Rehabilitation Research and Training Centers in April 1986.

Future Plans—Further analyses on the verbal-cognitive, sensory, and neuromuscular data will be forthcoming when followup data is completed at the end of year 1986. As a result, during Year 3 of the Project, a culturally-sensitive Family Interventions Manual for Handicapped Mexican-Americans will be developed for modifiable factors, based on social learning theory and principles of operant learning, which promote patterns of family interaction and/or attitudes that facilitate the maintenance or development of the previously identified work adjustment competencies. The results of the research also will be disseminated regionally and nationally during each year of the Project.

Laser Removal of Tattoos and Port Wine Stains

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Sponsor: Scottish Home and Health Department

Purpose—Clinical trials of the use of lasers to remove tattoos and Port Wine Stains are well advanced. The techniques are both based on the selective absorption of energy and optothermal conversion where peak temperature distribution is governed by the pulse length (duration of irradiation).

Progress—In tattoos, the most common and obvious chromophores (pigments) are carbon-based or blue/green. The skin is naturally most transparent in the red and near infrared regions of the "visible" spectrum, whereas the tattoo pigments are absorbent. A Ruby laser (694 nm) is currently used but the ND:YAG

laser is a rational alternative. The laser is Q-switched to give a pulse length of 30 ns. Based on a 5 mm diameter light spot, this provides the desirable power density of 3 Tw/m². Usually a local anaesthetic is administered with a vasoconstrictor, and 4 exposures at monthly intervals are typically required to eradicate tattoos. The epidermis is not disrupted, and dermal scarring is not normally apparent. Accidental tattooing, such as pigmentation arising from close-range firearm discharge, as well as decorative tattoos, can be treated; but irradiation of coal dust within the dermis can result in epidermal rupture.

Port Wine Stain haemangioma are being

treated using a pulsed dye laser tuned to 577 nm and 300 μ s pulse length. The blood in the

aberrant vessels acts as the target and thermal denaturation extends to the perivascular tissue.

The Research and Training Center on Independent Living (RTC/IL)

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Sponsor: *The Research and Training Center on Independent Living*

Purpose—The mission of the Research and Training Center on Independent Living (RTC/IL) is to develop and disseminate practical techniques that enable people with severe disabilities to live more independently. These new technologies include service delivery systems and skill training methods that improve social services and community support for people with disabilities.

RTC/IL is devoted exclusively to independent living. Our foremost constituency is the network of more than 300 independent living programs throughout the country and the people they serve. Estimates indicate that each year these programs provide direct services to over 140,000 disabled individuals.

Progress—Specific research and training activities for 1986 are:

1) **Promoting Consumer Involvement:** Teaching consumers with severe disabilities new ways to improve their community and its services is a promising approach to independent living. In the past 4 years, Stephen Fawcett and colleagues have developed and evaluated the Concerns Report Method. This unique self-help method allows disabled citizens and their families to assess, prioritize, and convey their concerns to decision makers.

To date, over 2,500 disabled residents have used the Concerns Report Method to establish priorities for independent living services.

2) **Involving Disabled Consumers in Community Change:** Many community decisions affect individuals with disabilities and their families. For disabled persons to achieve equal opportunities, they must assume leadership roles in their communities.

Project staff have prepared self-help guides on how to identify, select, report, and discuss

issues; lead group discussions; and take action on issues. Procedures for establishing effective consumer groups and training current and new members have also been prepared, evaluated, and disseminated to interested consumer groups.

3) **Training Attendant Care Management Skills:** Attendant care is a vital service for many people with severe disabilities who live independently. Until now, there has been no empirically based model for teaching consumers how to train and manage an attendant.

Project staff are currently developing complementary materials for agency staff so they can implement consumer training in their own settings. (Plans for next year include field testing the complete procedures package in two settings).

4) **Encouraging Courteous Service Provision:** People with disabilities frequently must deal with human service agencies, such as local welfare offices, that can be insensitive to their needs. From applications of the Concerns Report Method, we have identified a perceived lack of courtesy and responsiveness in service provision as a major concern of people with disabilities.

5) **Promoting Community Support for Independent Living:** A top concern for independent living technology development is how to enlist community support for issues related to independent living. Most Independent Living Centers (ILCs) agree that it is essential to gain community support and that their current efforts could be more successful.

A self-help guide is being prepared to allow ILCs to prepare slide presentations for their own use. The written guide will include chapters on how to edit a presentation script to describe local services and concerns, how to devel-

op a slide program, how to deliver a scripted slide presentation, and how to evaluate the impact of the presentation on an audience.

6) Policy Training in State Disabilities Planning: State advisory committees on disabilities try to bridge the gap between disabled citizens and the executive agencies and legislative bodies designed to serve them. However, the committees often lack crucial information about disability issues, such as employment, and this limits their ability to respond effectively to disabled citizens' concerns.

This project will provide training and technical assistance to the Kansas Advisory Committee on Employment of the Handicapped (KACEH). The goal will be to develop and communicate a document, Policy Choices on Employment, that will become a prototype for providing technical assistance to all state planning committees on disabilities.

Once the document is completed, it will be made available to state advisory committees on disability, legislative bodies, and staff of vocational rehabilitation and other executive agencies. Portions of the document will be used to assist policymakers in making choices about various issues related to employment, such as job training and modifications in the work place. In addition, the Policy Choices on Employment document will serve as a model for other researchers interested in analyzing state policies related to employment and other disability issues.

7) Improving Media Portrayals of Persons With Disabilities: Media professionals are in an ideal position to shape the public image of people with disabilities. Their capacity to communicate ideas and present appropriate models is unequalled in our society. Yet, the media has been criticized for perpetuating stereotypes through inaccurate portrayals of disabled people.

Inaccurate portrayals may persist because there are no clear guidelines indicating a preferred style and no standard terminology for writing and reporting about disabilities. In response to recommendations from the RTC/IL Advisory Board and consumers nationwide, the RTC/IL staff developed a pamphlet, "Guide-

lines for Reporting and Writing About People With Disabilities." It was compiled with input from over 50 national disability organizations and represents a consensus on acceptable terminology and portrayals concerning disability issues. More than 30,000 copies have been disseminated to disability organizations and service agencies throughout the country.

The Guidelines were submitted to the boards of editors of the Associated Press and the United Press International for possible inclusion in upcoming editions of their stylebooks. This will help establish national policies on the use of disability terms and portrayals. But, in addition to national policies, consumer groups need strategies to influence portrayals by their own local media to help ensure adoption of established guidelines.

8) Evaluating the Impact of ILCs: Independent living service providers and policymakers need valid, reliable, and economical methods to evaluate the impact of ILCs. The goal of the program evaluation project, led by James Budde, is to develop and field test evaluation standards that can be used by ILCs. As a preliminary step, investigators have developed methods to measure attainment of consumer goals, ILC impact, and the removal of handicapping conditions within the community.

9) Social Support Systems for Enhancing Independent Living: Self-help and social support have been major components of the IL movement. For many disabled citizens, ILCs are their primary social support system. Research analyzing social support systems is limited and focuses primarily on either theoretical discussions about the importance of social support or descriptions of individual support programs. There is little research demonstrating the effectiveness of such groups in general, or their role in promoting independence of disabled persons in particular.

In the IL field, research is needed to determine: 1) the prevalence of social support systems for people with disabilities; 2) the relationship between social support groups and ILCs; 3) characteristics of successful support systems; and 4) procedures needed to enhance social support group effectiveness.

Future Plans—Training and Dissemination Activities: RTC/IL plans a number of training and dissemination activities in the areas of university training, in-service training and technical assistance, and product development and dissemination.

An IL leadership training program has been proposed wherein disabled persons will receive scholarships to pursue academic training and field-based practice. The program is intended to provide talented disabled persons with training and experience needed to assume leadership roles in the IL movement.

Product development and dissemination activities for next year include continued publication of the *Independent Living Forum*, development of one additional *RTC/IL Monograph*,

and development of numerous training manuals and resource directories for inclusion in the *RTC/IL Bibliography*. The *Forum* is published quarterly and disseminated to over 1,000 individuals and organizations. We expect to complete or initiate work on 10-12 training manuals and resource directories for the *Bibliography*. Additional research publications are planned for disseminating research outcomes in the rehabilitation field.

Over the next 5 years, RTC/IL will continue to explore new research areas and expand knowledge about the field. We will also continue to make sure consumers are satisfied with the direction of our research, the kind of training we provide, and the products we create.

Growth and Bone Haemodynamic Responses to Castration in Male Rats: Reversibility by Testosterone

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Sponsor: None Listed

Final Results—Orchidectomy in postpubertal 55-day-old rats, compared to sham-operated controls, led beyond 2 months to a decrease in body weight (87 percent of controls by 120 days), tibial length (97 percent of controls), and in tibial calcium content (85 percent of controls). Bone plasma flow increased 3 times to reach a peak at 31 days; it was decreased, but not significantly, at 86 and 120 days. The number of osteoclasts was maximal at 51 days (x 2.3) and was still elevated at 120 days. The calcium ac-

cretion rate increased briefly at 31 days (110 percent of controls) and was diminished at 86 and 120 days (78 percent of controls).

The initial "physiological" changes in the tibia occurred before any weight change and might be directly due to the lack of androgens. They can be interpreted as inducing the conditions for enhanced bone resorption. Testosterone replacement therapy, initiated after the initial haemodynamic response, inhibited the negative effect of castration on bone growth.